Claims

1. A method of depositing thin films comprising the steps of:

depositing a conductive, ferromagnetic thin film layer on an article;

depositing a buffer layer on the conductive, ferromagnetic thin film layer comprising carbon and nitrogen while applying a bias voltage from zero to a first negative voltage applied to the conductive, ferromagnetic thin film layer for a first time period;

changing the bias voltage to a second negative voltage, the second negative voltage being greater in magnitude than the first negative voltage; and

depositing a thin film layer comprising carbon and nitrogen on the buffer layer while the bias voltage is the second negative voltage for a second time period.

2. The method of claim 1 wherein the step of depositing the thin film layer comprising carbon and nitrogen further comprises using a dual cathode pulsed sputtering technique.

3. The method of claim 1 wherein the step of depositing a conductive, ferromagnetic thin film layer further comprises holding the article at a first set of points while depositing the conductive, ferromagnetic thin film layer and the step of depositing a thin film layer comprising carbon and nitrogen further comprises applying bias voltage through a second set of points different from the first set of points while depositing the thin film layer comprising carbon and nitrogen.

4. The method of claim 3 further comprising the steps of rotating the article after depositing the conductive, ferromagnetic thin film layer and before depositing the buffer layer.

5. The method of claim 1 wherein the second negative voltage is a dc voltage from -50v to -400v.

6. The method of claim 1 wherein the second negative voltage is a pulsed voltage from zero to -400v.

7. The method of claim 1 wherein step of depositing a thin film layer comprising carbon and nitrogen continues until a thickness of material comprising carbon and nitrogen is from 0.5 to 9 nm.

8. The method of claim 1 wherein the second time period is longer than the first time period.

9. The method of claim 1 wherein the second time period is approximately four times as long as the first time period.

10. The method of claim 1 wherein a combined thickness of the buffer layer and the thin film layer comprising carbon and nitrogen is from 0.5 to 9 nm, the second negative voltage is a dc voltage from -50v to -400v and the method further comprises the step of applying the second negative voltage to the conductive, ferromagnetic thin film layer at one or more points where the conductive, ferromagnetic thin film layer was not subject to shadowing during deposition.

11. A method for sputtering a thin film protective layer comprising the steps of:

forming a first thin film of the protective layer on an underlying film using ions with a first kinetic energy; and

forming a second thin film of the protective layer on the first thin film of the protective layer using ions with a second kinetic energy, the second kinetic energy being higher than the first kinetic energy.

12. The method of claim 11 wherein the first thin film of the protective layer is less dense and softer than the second thin film of the protective layer.

13. The method of claim 11 wherein the step of forming the first thin film of the protective layer further comprises using a zero bias voltage applied to the underlying film.

14. The method of claim 11 wherein the protective layer comprises carbon and nitrogen.

15. The method of claim 11 wherein the underlying film is a magnetic layer used in magnetic recording.

16. A method of depositing a protective thin film on an article comprising the steps of:

depositing a conductive, magnetic thin film while holding the article at a first set of points;

depositing a buffer layer on a conductive thin film layer, the buffer layer comprising carbon and nitrogen and being deposited using ions with a first average kinetic energy while holding the article at a second set of points;

depositing a thin film layer comprising carbon and nitrogen onto the buffer layer using ions with a second average kinetic energy.

17. The method of claim 16 further comprising the steps of rotating the article after depositing the conductive, ferromagnetic thin film layer and before depositing the buffer layer.

18. The method of claim 16 wherein a combined thickness of the buffer layer and the thin film layer comprising carbon and nitrogen is from 0.5 to 9 nm.